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TITLE: Surveillance After Initial Treatment for Breast Cancer: A Population-Based Study of Variation in and Outcomes of Care

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CONTRACTING ORGANIZATION: Medical College of Wisconsin
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13. ABSTRACT *(Maximum 200*

This purpose of this report is to describe the use of follow-up tests (mammograms, chest radiographics, and bone scans) and office visits among breast cancer survivors. Determinants of testing, and use of tests among a control population, are also described.

Among a cohort of breast cancer survivors aged 65 and older who developed breast cancer in 1991 and underwent surgical treatment, the rate of use of mammography and chest radiographs was about 80% over the first two years after treatment. The relative use of chest radiographs was 1.6 times the use in a control population matched for age, gender, and geographic residence, and the relative use of mammograms was 2.3 times. About 25% of the cohort had a bone scan, which was 8 times the use in the control population. The use of chest radiographs and mammograms was high among breast cancer survivors of different ages, racial, and socioeconomic strata. In all age groups of the controls, the use of chest radiographs exceeded the use of mammograms. Breast cancer survivors had a mean of 9-10 office visits per year in the two years after treatment.

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TABLE OF CONTENTS

5.) INTRODUCTION

Randomized trials conducted in Europe (1, 2) indicate little benefit from surveillance testing of survivors of early stage breast cancer who are clinically free of disease. The generally accepted strategy for follow-up includes surveillance mammography, and periodic office visits. Some previous data indicate that many breast cancer survivors receive substantial testing to detect distant disease recurrence, but no population-based data are available.

This study utilizes selected population-based secondary data bases to explore issues relevant to the surveillance of early stage breast cancer patients aged 65 and older, after initial treatment. The specific aims of this study are:

1. To describe the use of medical resources (e.g. office visits, bone scans, chest radiographs, blood tests) in patients who have undergone mastectomy or breast-conserving surgery with radiation for early stage breast cancer.

2. To determine predictors of use of surveillance resources (e.g. age, race, geographic area, socioeconomic status).

3. To determine whether an association exists between patterns of intensity in use of surveillance resources and two outcomes: death from breast cancer, and inpatient hospital days associated with a diagnosis of metastatic cancer.

6.) BODY

a.) Underuse of Mammography Among Older Breast Cancer Survivors.

(Specific Aims 1 & 2)

Much of this work was described in the last annual report. During the past year, the analyses were completed. The paper has been submitted for publication. A copy is attached as Appendix A.

b.) Use of Chest Radiographs, Bone Scans, and Mammograms Among Older Breast Cancer Survivors. (Specific Aims 1 & 2)

Methods

Two cohorts were created. The first is similar to that described above and consisted of female breast cancer patients selected from linked Medicare files. A patient was selected if she: lived in a SEER site, was diagnosed with a first breast cancer in 1991, aged >64

years at diagnosis, was born in the 20th century, had unilateral cancer, had AJCC stage I or II disease, and underwent cancer directed surgery. These criteria yielded a cohort of 5313 patients. Patients were excluded if not alive and eligible for Medicare Parts A & B and not in an HMO for 30 months after diagnosis, yielding 3990 cases. Four of these cases were dropped for incomplete data, yielding a case cohort of 3986 patients.

The second cohort was created by matching the 3986 cases above to controls chosen from the Medicare 5% Non-Cancer Sample Summary Denominator file. This is a 5% random sample of Medicare beneficiaries residing in SEER sites, who are not found in the SEER registry data. A control was matched to a specific case by sex, SEER site of residence, and year of birth. Additionally, the control was required to be alive and eligible for Medicare Parts A & B and not in an HMO for the same 30 month period as the case. The particular control matched to the case was selected at random from the set of controls meeting the matching criteria. The matching was repeated five times to generate a control cohort of 19,930 patients, 5 each for the 3986 cases. Surveillance tests and provider visits were compared between cases and controls in year 1 and year 2 after initial surgical treatment. The figures reflect test use in both year 1 and year 2. Surveillance year 1 was defined as months 6-18 and year 2 as months 19-30 after initial treatment.

Results

The characteristics of the breast cancer survivors and control subjects are presented in Table 1. Overall the use of each test was greater among breast cancer survivors than among the cancer-free Medicare control subjects (Fig. 1). Although the percentage use of bone scans was the least of the 3 tests studied, the relative use of this test in breast cancer survivors compared to control subjects was the greatest.

Fig. 2 shows the use of the 3 tests in breast cancer survivors and controls, by age group. With increasing age, the relative use of mammography in cancer survivors compared to control subjects rises. This is not due to greater use of mammography among older breast cancer survivors, but rather is due to the fact that the use of mammography declines more dramatically with age among the control subjects than among the breast cancer survivors. The percentage of breast cancer survivors receiving chest radiographs is slightly less than the percentage receiving mammography in each age group except for women aged 80 and older, in whom the use of chest radiographs exceeds the use of mammograms. The use of chest radiographs among control subjects is substantial. In fact, the use of chest radiographs among control subjects actually exceeds the use of mammograms in every age group except for women aged 65-69 years. The use of bone scans is consistently low among control subjects of all ages, while the use among breast cancer survivors declines with advancing age.

Fig. 3 shows the use of these tests among different racial groups. The patterns of use of these tests are similar among women of different races, except that among breast cancer

survivors, black women and women of other races had greater relative use of bone scans than did white women.

Table 1. Description of Cohorts

	Cases		Control Subjects	
	n	% of cohort	n	% of cohort
Age				
65-69 years	1181	29.6	6,525	32.7
70-74 years	1143	28.7	5,510	27.6
75-79 years	851	21.3	4,170	20.9
80+ years	811	20.3	3,725	18.7
Race				
White	3610	90.5	17,273	86.7
Black	155	3.9	1,292	6.5
Other/Unknown	221	5.5	1,365	6.8
SEER Site				
San Francisco	413	10.4	2,065	10.4
Connecticut	747	18.7	3,735	18.7
Detroit	793	19.9	3,965	19.9
Hawaii	86	2.2	430	2.2
Iowa	700	17.6	3,500	17.6
New Mexico	180	4.5	900	4.5
Seattle	601	15.1	3,005	15.1
Utah	212	5.3	1,060	5.3
Atlanta	254	6.4	1,270	6.4
PCI				
25%	$12,823		$11,833	
Median	$15,651		$15,027	
75%	$19,525		$18,929	
High School+ Ed.				
25%	75.2%		74.3%	
Median	82.3%		80.6%	
75%	88.9%		87.0%	
AJCC Stage				
In Situ	427	10.7	----	
Stage I	2208	55.4	----	
Stage II	1351	33.9	----	
Treatment				
Mastectomy	2515	63.1	----	
BCS w/Radiation	884	22.2	----	
BCS w/out Radiation	587	14.7	----	

(Proprietary data)

Fig. 4 presents the percentage use of tests according to level of per capita income in the census tract or zip code of residence of the subject. The use of mammography among breast cancer survivors is remarkably consistent across income levels. The use of mammography among the control subjects increases with increasing income, leading to a decrease in the relative use of mammograms in the more affluent survivors compared to controls. A similar phenomenon occurs in the use of mammograms by level of education (Fig. 5) in the area of residence of the subject, where the greater use of mammograms among highly educated control subjects leads to lesser differential use between survivors and control subjects.

The relative use of chest radiographs and bone scans varies little by per capita income or education. The use of chest radiographs among survivors is almost as high as the use of mammograms in all socioeconomic groups. The use of chest radiographs among control subjects exceeds the use of mammograms in all socioeconomic strata (Fig. 4&5).

The use of mammograms in survivors compared to controls varies by geographic site. However, most of the variation is due to differences in the use of mammography by control subjects, and there is little variation in the use of mammography by breast cancer survivors (Fig. 6). There is modest variation by site in the use of chest radiographs among both survivors and control subjects. In one site, the use of chest radiographs among cancer survivors exceeded the use of mammograms, and the use of chest radiographs among control subjects was almost double the use of mammograms among control subjects.

(Proprietary data)

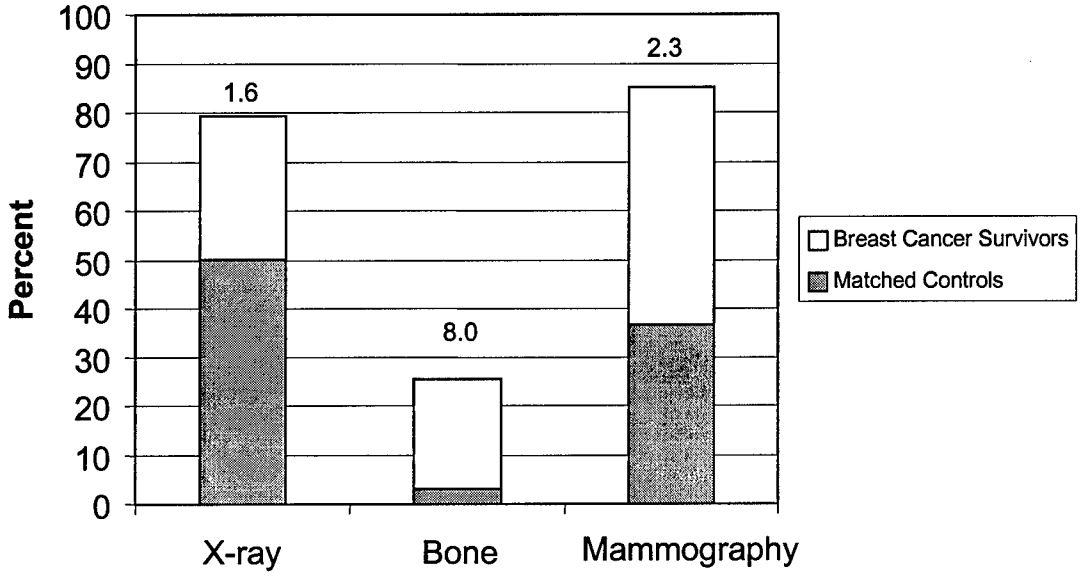

Figure 1

Percent of subjects undergoing mammograms, chest radiographs, and bone scans during one or both years after breast cancer treatment among breast cancer survivors and among non-cancer control subjects matched for age, gender, and geographic residence. The numbers above the bars indicate the ratio of use among the survivors compared to the controls.

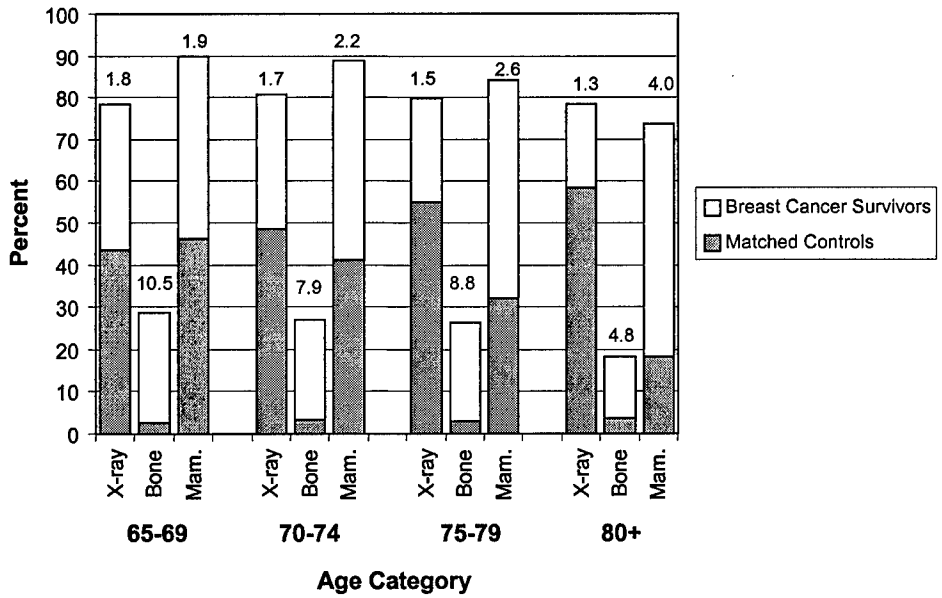

Figure 2

Percent of subjects undergoing mammograms, chest radiographs, and bone scans during one of both years after breast cancer treatment among breast cancer survivors and among non-cancer control subjects matched for age, gender, and geographic residence, by age group. The numbers above the bars indicate the ratio of use among the survivors compare to the controls.

(Proprietary data)

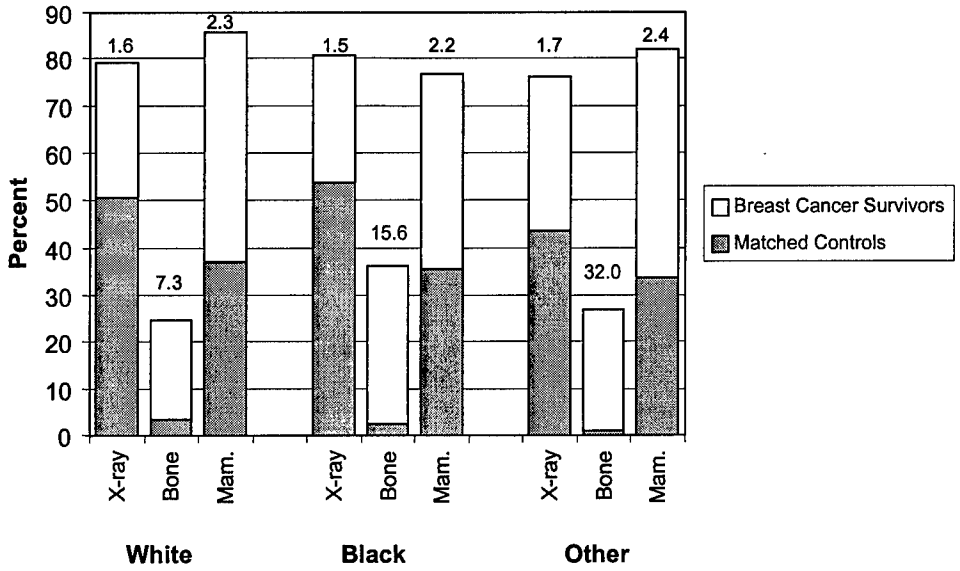

Figure 3

Percent of subjects undergoing mammograms, chest radiographs, and bone scans during one of both years after breast cancer treatment among breast cancer survivors and among non-cancer control subjects matched for age, gender, and geographic residence, by race. The numbers above the bars indicate the ratio of use among the survivors compared to the controls.

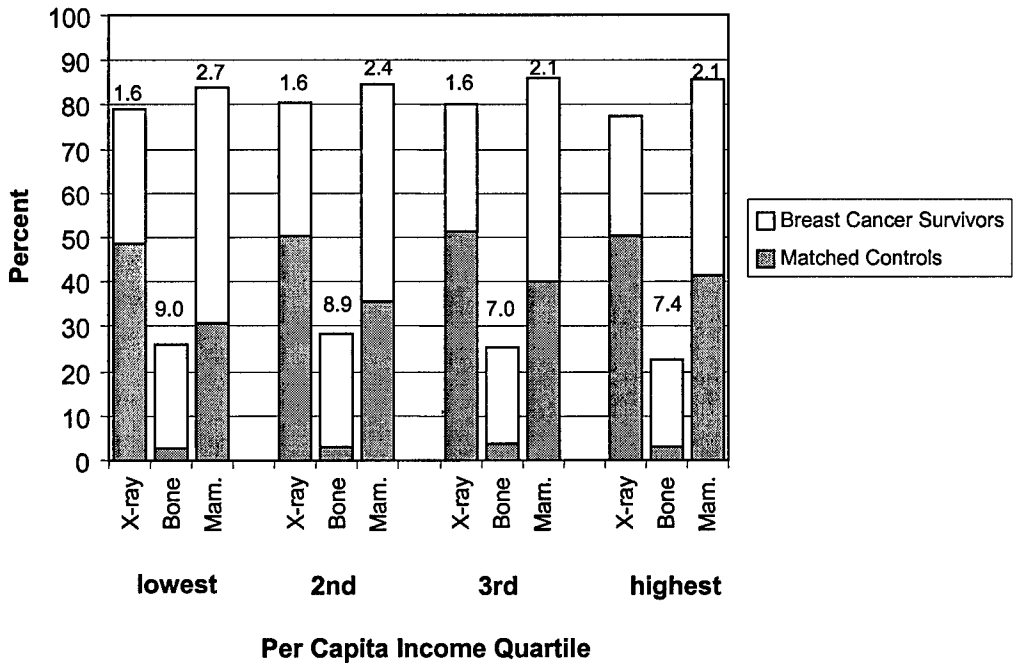

Figure 4

Percent of subjects undergoing mammograms, chest radiographs, and bone scans during one of both years after breast cancer treatment among breast cancer survivors and among non-cancer control subjects matched for age, gender, and geographic residence, by per capita income. The numbers above the bars indicate the ratio of use among the survivors compared to the controls.

(Proprietary data)

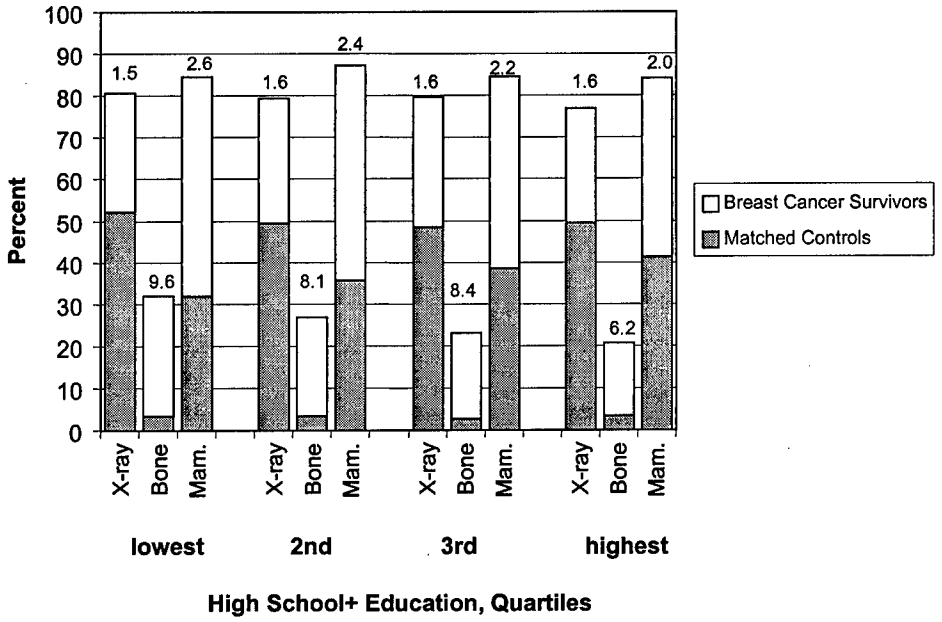

Figure 5

Percent of subjects undergoing mammograms, chest radiographs, and bone scans during one of both years after breast cancer treatment among breast cancer survivors and among non-cancer control subjects matched for age, gender, and geographic residence, by education. The numbers above the bars indicate the ratio of use among the survivors compared to the controls.

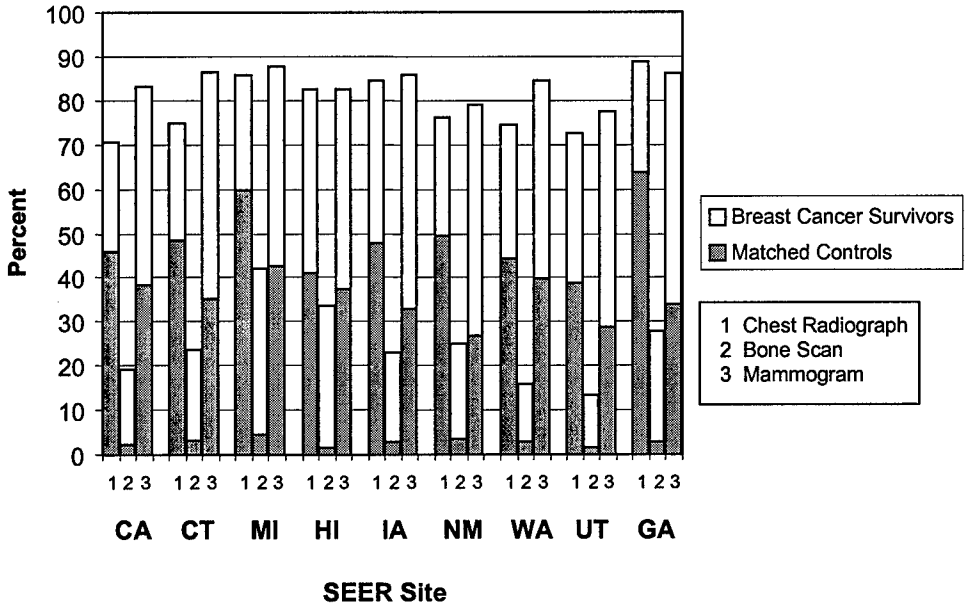

Figure 6

Percent of subjects undergoing mammograms, chest radiographs, and bone scans during one of both years after breast cancer treatment among breast cancer survivors and among non-cancer control subjects matched for age, gender, and geographic residence, by SEER site.

(Proprietary data)

c.) Physician Visits in Follow-up to Treatment of Breast Cancer
(Specific Aim 1)

Methods

Physician follow-up visits for patients who had undergone mastectomy or breast-conserving surgery with radiation for early stage breast cancer were evaluated. Office visits in breast cancer cases were compared to office visits in a control population. Cases and controls were identified as described above (See part B methods). Physician Part B Claims were used to identify mammography, chest radiographs, bone scans, and office visits. The HCFA Specialty Code was used to identify the specialty type of the provider. Providers were grouped into a Primary Care Grouping and a Breast Cancer Care Grouping (Table 2). The Primary Care Grouping included General Practice, Family Practice, and Internal Medicine. The Breast Cancer Care Grouping included Hematology/Oncology, Medical/Oncology, Surgical/Oncology, Radiation/Oncology, and General Surgery. A group of All Visits was also used and included any provider visit in the correct time period. Annual visits for each provider care group were compared in year 1 and year 2 between cases and controls.

Table 2. HCFA Specialty Codes For Provider Groups.

	Specialty Type	HCFA Specialty Code
Primary Care:		
	General Practice	1
	Family Practice	8
	Internal Medicine	11
Breast Cancer Care:	Hematology/Oncology	83
	Medical/Oncology	90
	Surgical/Oncology	91
	Radiation/Oncology	92
	General Surgery	2

Results

Breast cancer survivors had approximately 3 additional office visits compared to controls in year 1 and approximately 2.5 additional office visits in year 2 (Table 3). Most of the additional office visits were to Breast Cancer Care providers but some additional visits also occurred to Primary Care Providers.

(Proprietary data)

Table 3. Physician Visits Per Surveillance Year.

	Year 1		Year 2	
	Cases mean (s.d.)	Controls mean (s.d.)	Cases mean (s.d.)	Controls mean (s.d.)
All Visits*	9.8 (6.7)	6.7 (5.7)	9.1 (6.6)	6.6 (5.6)
Primary Care*	4.4 (4.4)	3.7 (4.0)	4.0 (4.1)	3.7 (4.0)
Breast Cancer Care*	2.1 (2.6)	0.23 (1.1)	1.9 (3.0)	0.23 (1.2)

*$p < 0.0001$ for all provider types

Ongoing Analyses of Provider Visits

Ongoing analysis of provider visits include the following: 1) identification of lower and higher users of office visits, and the association of office visits with the use of other surveillance tests (chest radiographs, mammograms, and bone scans), 2) identification of groups of subjects using mostly primary care or mostly specialty care, 3) evaluation of the association between use of primary care or specialty care and indicators of quality of care such as annual mammography, and 4) evaluation of a provider visit with a medical oncologist as an indicator of quality of care.

7.) CONCLUSIONS

Many breast cancer survivors do not undergo the recommended annual follow-up mammograms. The use of mammography is lower among woemn who underwent breast-conserving surgery without radiotherapy than among those who underwent breast-conserving surgery with radiotherapy. Given the high rate of local recurrence of breast cancer among women who underwent breast-conserving surgery without radiotherapy in the randomized trials, further investigation of this finding is warranted.

In general, the use of surveillance follow-up tests for breast cancer survivors over a 2 year period is high for mammograms and chest radiographs, and lower for bone scans. However, the ratio of testing in survivors compared to control subjects is much higher for bone scans. The use of chest radiographs among survivors is almost as high as the use of mammograms. However, among control subjects, the use of chest radiographs is equal to or exceeds the use of mammograms. Those who estimate the cost savings that could be made by decreasing use of chest radiographs among breast cancer survivors must consider the high use of this test in the general population. Moreover the fact that the use of chest radiographs in the general population is greater than the use of mammograms in several demographic groups raises questions about the appropriate use of resources.

Breast cancer survivors have a significant increase in office visits in the two years following initial surgical treatment. In the year following treatment, subjects have

approximately 2 additional visits to breast cancer care providers and one additional visit to a primary care provider. Future work must be done to evaluate whether the increase in provider visits is associated with the quality of follow-up care provided and improved outcomes.

8.) REFERENCES

1. Del Turco MR, Palli D, Cariddi A, Diatto S, Pacini P, Distante V. For the National Research Council Project on Breast Cancer Follow-up. Intensive diagnostic follow-up after treatment of primary breast cancer. A randomized trial. JAMA 1994;271:1593-1597.

2. The GIVIO Investigators. Impact of follow-up testing on survival and health-related quality of life in breast cancer patients: A multicenter randomized controlled trial. JAMA 1994;271:1587-1592.

9.) APPENDICES

1. NIH-National Cancer Institute – SEER Medicare Data Users Workshop
MM, Schapira, AB Nattinger, TL McAuliffe. Medical College of WI.
"Assessing Surveillance Periods for Breast Cancer After Initial Therapy."

SEER-MEDICARE DATA USERS WORKSHOP
National Institutes of Health
National Cancer Institute
June 24, 1998

ABSTRACT

Assessing Surveillance Periods for Breast Cancer After Initial Therapy. MM Schapira, AB Nattinger, TL McAuliffe. Medical College of Wisconsin, Milwaukee, WI.

Introduction

Annual mammography is widely recommended as surveillance for breast cancer survivors. However, the level of adherence to these recommendations is unknown. We conducted a population-based study to elucidate mammography use in older breast cancer survivors and to explore determinants of such use. This presentation will focus on two specific aspects of the study: 1) the temporal relationship between date of diagnosis and initial surgical treatment, and 2) the relationship between initial treatment and mammography claims in the years following treatment.

Methods

A clinical cohort of women with a first diagnosis of early stage breast cancer was defined from the PEDSF file of the linked SEER-Medicare database. Subjects were required remain alive for 36 months after diagnosis. In addition, subjects were required to be eligible for Medicare part A and part B, and not a member of an HMO, for each month of the 36 month period after diagnosis. The date of diagnosis was assigned as the 15'th of the month of the SEER month of diagnosis. The time from diagnosis to treatment was identified as follows. MEDPAR files were searched from 1 month prior to 6 months after the month of diagnosis, for an inpatient procedure that corresponded to the SEER initial surgical treatment. For those subjects in which an inpatient treatment was identified, a "time to treatment" was calculated as the difference in days between the date of the surgical procedure and the date of diagnosis. For subjects in which an inpatient hospitalization was not identified (18%), the treatment date was assumed to be 30 days after diagnosis.

We hypothesized that surveillance tests would occur in a cyclical fashion from the time of diagnosis. The National Claims History - 100% Physician Supplier file was used to identify mammography claims for each subject in the 36 month time period after initial treatment. Mammography CPT4 codes used were 76090, 76091, and 76092. Surveillance time periods were determined based upon the distribution of mammography claims in the months after initial treatment. Logistic regression models were used to evaluate the effect of clinical, socioeconomic, and treatment variables on the use of mammography.

Results

Of those subjects who had inpatient treatment identified, 99% underwent a treatment operation within 3 months and 95% had surgical treatment within 1 month of diagnosis. There was no significant difference in time until surgical treatment among different treatment groups (mastectomy, breast conserving surgery without radiotherapy, or breast conserving surgery with radiotherapy). The distribution of mammography claims in the 36 months after initial treatment peaked at 12, 24, and 36 months. Therefore, it was determined that the following definition of time frames were most likely to capture a surveillance mammography occurrence: Surveillance Year 1: 7-18 months after initial treatment, Surveillance Year 2: 19-30 months after initial treatment. Mammography surveillance use was further defined as follows: Annual Surveillance: mammography in years 1 and 2, One Year Surveillance: mammography in year 1 or year 2 but not in both years, or No Surveillance: no mammography in year 1 or year 2.

Of the 3885 women studied, 62% underwent annual mammography, 23% underwent mammography in one of two years, and 15% had no mammography claim in the two years evaluated. When controlling for other factors including age, stage, and geographic site, the use of annual mammography was less in women treated with BCS without radiotherapy, (OR 0.36, 95% CI: 0.28-0.45), and in women treated with mastectomy, (OR 0.43, 95% CI: 0.36-0.52), compared to women treated with BCS with radiotherapy. Annual mammography was also less likely in women with stage I, (OR 0.75, 95% CI 0.59-0.95), or stage II disease, (OR 0.61, 95% CI: 0.47-0.78), compared to women with in situ disease.

Conclusions: In the majority of patients, surgical treatment occurs close to the time of diagnosis. There is a cyclical occurrence of mammograms that is in a temporal relationship to initial treatment. This finding provides face validity to the inference that the mammograms identified are being used as surveillance tests.

SEER-MEDICARE DATA USERS WORKSHOP
National Institutes of Health
National Cancer Institute

June 24, 1998

TITLE: **Generalizability of the Surveillance, Epidemiology, and End Results Registry Population: Factors Relevant to Epidemiologic and Health Care Research**

AUTHORS NAMES: Ann B. Nattinger, Timothy L. McAuliffe, and Marilyn M. Schapira

WORK AFFILIATION: Medical College of Wisconsin

ADDRESS: 8701 Watertown Plank Road
Milwaukee, WI 53226

ABSTRACT: To assess the generalizability of the population included in the Surveillance, Epidemiology, and End Results (SEER) tumor registries to the overall United States population, we compared the population of the 198 SEER counties to the population of 2882 non-SEER counties regarding sociodemographic factors, physician availability, and availability of pertinent hospital resources. The population residing within the SEER areas is more affluent, has lower unemployment, and is substantially more urban than the remainder of the US population ($p<0.001$ for each). The SEER areas have fewer general and family practice physicians, but more total nonfederal physicians, general internists, and specialists relevant to cancer care. SEER areas have fewer Joint Commission on Accreditation of Hospitals accredited hospitals, hospital beds, and hospitals with CT scanners, but more hospitals with bone marrow transplantation.

The differences between the SEER population and the remainder of the United States, especially SEER's higher socioeconomic status and more urban population, should be considered when generalizing from SEER to the entire country. J CLIN EPIDEMIOL 50;8:939-945, 1997.

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